NASA Procedural Requirements

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Subject: NASA Radio Frequency (RF) Spectrum Management Manual

Responsible Office: Human Exploration and Operations Mission Directorate

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Chapter 2: NASA Spectrum Management Program Roles and Responsibilities

2.1 Agency-Level Responsibilities

2.1.1 The Associate Administrator (AA) for Human Exploration and Operations Mission Directorate (HEOMD) is designated as the NASA Spectrum Manager and shall:

a. Publish the NASA Procedural Requirements (NPR) 2570.1, NASA Radio Frequency Spectrum Management Manual.

b. Ensure that all NASA activities comply with national and international rules and regulations applicable to the use of the EM spectrum as stated in the NTIA Manual of Regulations and Procedures for Federal Radio Frequency Management and the ITU Radio Regulations.

c. Ensure adequate NASA representation in international and national organizations and forums concerned with EM spectrum regulation and utilization.

d. Ensure adequate EM spectrum is available to support all Agency programs including NASA-sponsored commercial space programs.

2.1.2 The Deputy Associate Administrator (DAA) for Space Communications and Navigation (SCaN) shall be responsible for:

a. The overall planning, policy, and administration of the NASA Spectrum Management Program.

b. Chairing the SCaN Board of Directors (BoD) meetings which will be used as a forum for addressing program and policy-level spectrum issues. The NASA Headquarters offices and responsibilities in support of the BoD are identified in Section 2.2.

c. Appointing a Director of Spectrum Policy and Planning.

2.1.3 The Director of Spectrum Policy and Planning will be responsible for the Agency's programmatic implementation of policies and applicable procedures authorized by this NPR and the overall efficacy of the program. The Director has overall national and international spectrum policy and planning responsibility, as well as responsibility for planning of long-term national and international spectrum management initiatives aimed at improving the spectrum management environment within which NASA must operate. The Director of Spectrum Policy and Planning shall:

a. Designate a Deputy Director to act in his/her absence and assist in normal duties as required.

b. Designate an International Spectrum Program Manager and a National Spectrum Program Manager to fulfill the Agency's spectrum management responsibilities in accordance with this NPR.

c. Designate a NASA representative to the Interdepartment Radio Advisory Committee (IRAC) and representatives to the various IRAC subcommittees. When necessary; will also provide a nomination to the State Department for the chair of U.S. ITU-R Study Group 7 (Science Services).

2.1.4 The International Spectrum Program Manager shall carry out, under the direction of the Director of Spectrum Policy and Planning, the international spectrum management responsibilities assigned to the DAA SCaN, which are the EM spectrum activities involving entities external to the U.S., including the ITU, other non-NASA civilian space agencies (e.g., European Space Agency, Japanese Aerospace Exploration Agency, the Space Frequency Coordination Group (SFCG), and other entities external to the U.S. involved in the management of the EM spectrum.

2.1.5 The National Spectrum Program Manager shall:

a. Carry out, under the direction of the Director of Spectrum Policy and Planning, the domestic spectrum management responsibilities assigned to the DAA SCaN, which are the EM spectrum activities involving entities internal to the U.S., including the NTIA, the Federal Communications Commission, and other national entities involved in the management or regulation of the EM spectrum.

b. Ensure, in consultation with the applicable Center/Facility Spectrum Management Offices, that all frequency assignments are carefully reviewed as directed by the Director of Spectrum Policy and Planning or his/her designee, to determine if they should fall under the Sensitive But Unclassified (SBU) Category and/or should be Freedom of Information Act (FOIA) exempt in accordance with NPR 1600.1.

c. Ensure, in consultation with the International Spectrum Program Manager, that the Spectrum Management Implementation Plan, five-year Plan, and Long-Range Plan are reviewed and updated annually, if necessary, and cooperate in assisting the NTIA in its Federal Spectrum Strategic Plan effort.

d. Identify any programs at risk due to possible lack of spectrum allocations or the non-sustainability of these allocations because of commercial encroachment and/or possible electromagnetic interference (EMI) conflicts.

e. Chair the NASA Spectrum Managers Group (see Appendix E).

Note: Descriptions of the spectrum management structures for the ITU and interfaces between the U.S. national spectrum management structure and the ITU are contained in Appendices C and D.

2.1.6 The Director of the Spectrum Analysis Center shall oversee and manage activities within the Spectrum Analysis Center for the purpose of providing a centralized review process of Agency spectrum analyses and to perform selected technical analyses in consultation with the Director of Spectrum Policy and Planning and the NASA National and International Spectrum Managers. He or she will also coordinate with NASA Centers, as well as international and national organizations external to the Agency (e.g. NTIA, FCC, DoD, ITU, SFCG), in conducting both U.S. domestic and international spectrum analyses to advance the spectrum objectives of the Agency. The specific roles and responsibilities of the Spectrum Analysis Center are contained in the charter in Appendix F. Note: The structure of the NASA Spectrum Management Program is shown in Figure 2-1. NASA and its relationship to the national spectrum management structure are presented in Figure 2-2.

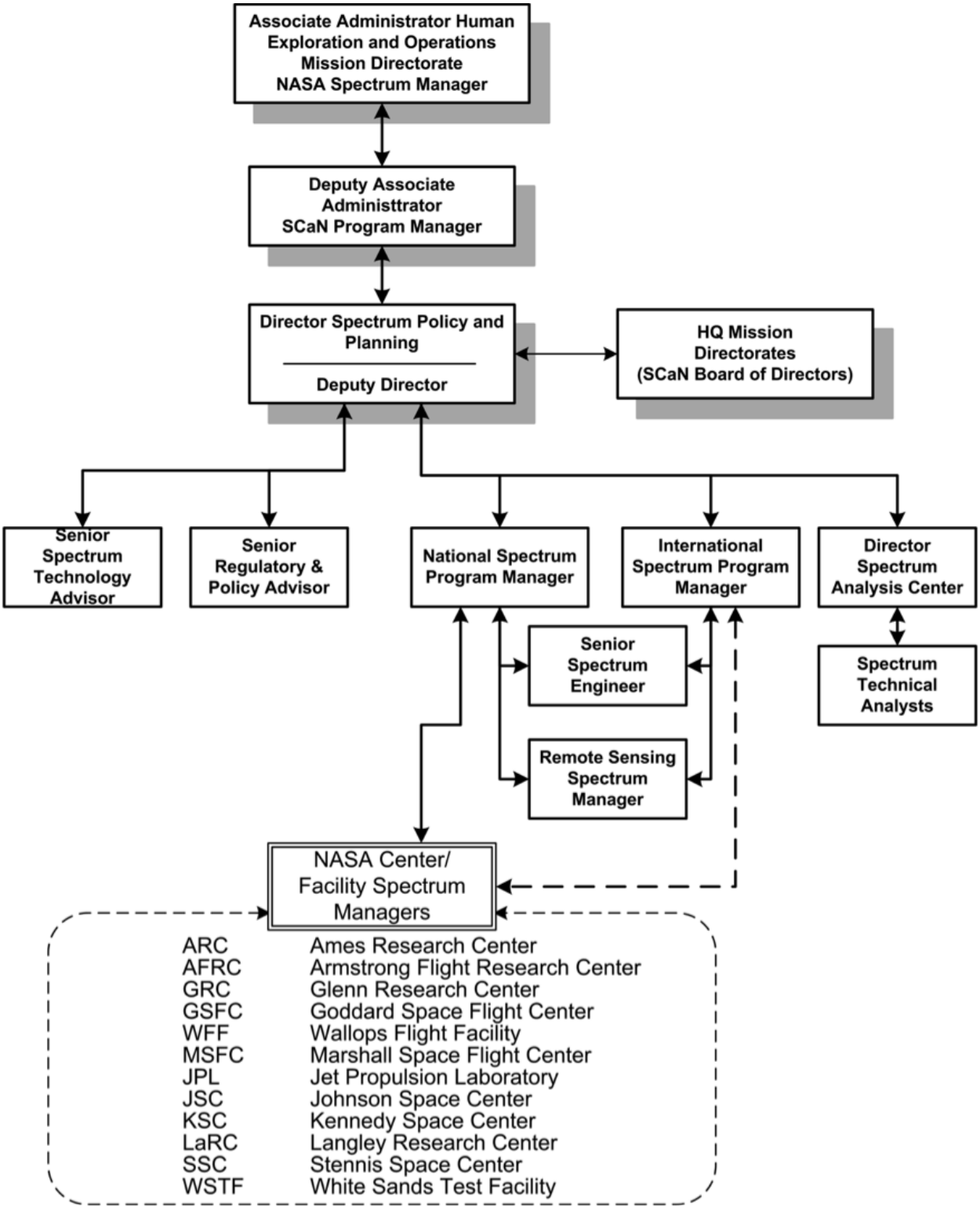

Figure 2-1 NASA Spectrum Management Program

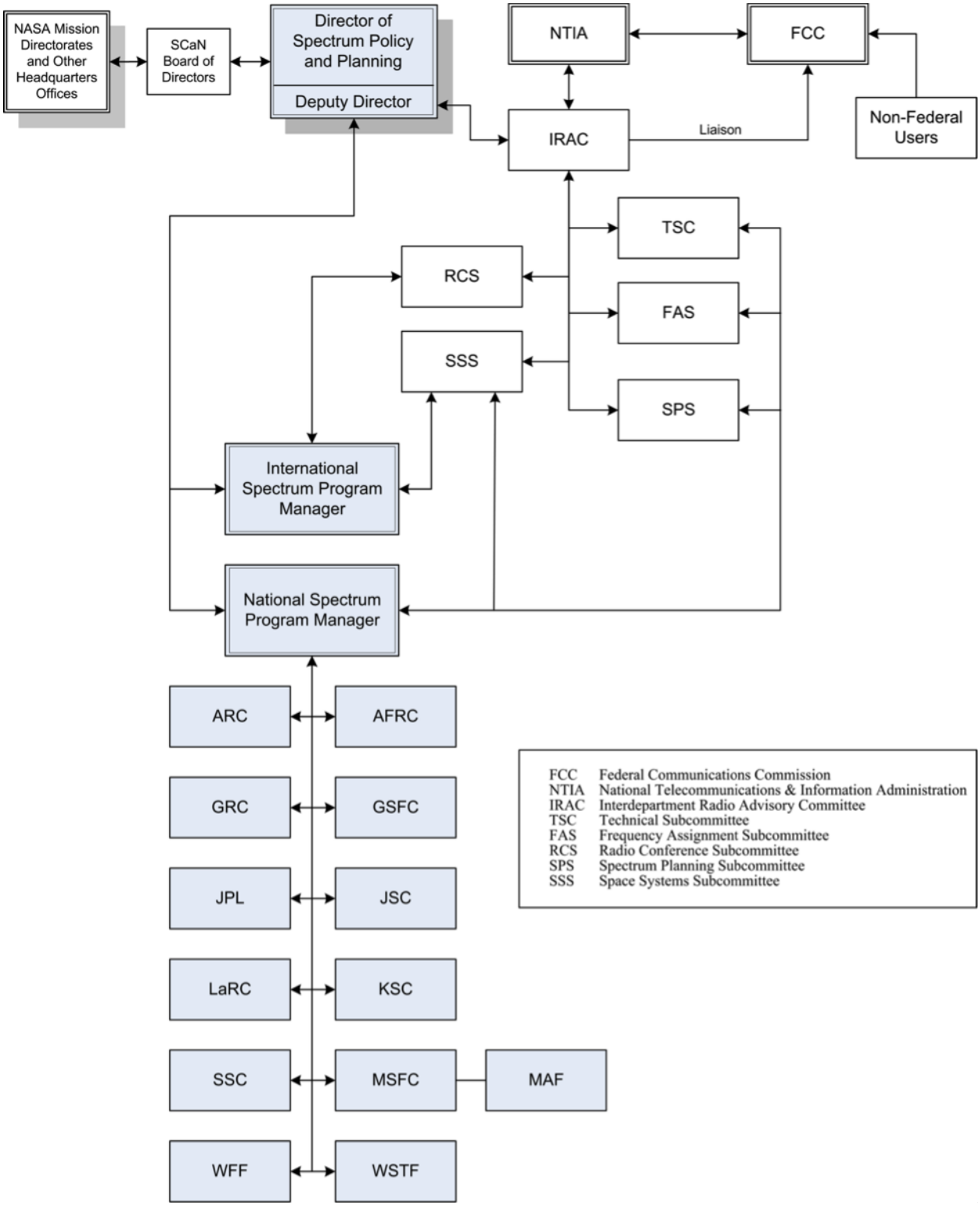

Figure 2-2 NASA/National Spectrum Management Structure

2.2 NASA Mission Directorates and Other Headquarters Offices Responsibilities

2.2.1 NASA Mission Directorates and other relevant Headquarters Offices shall each appoint a spectrum liaison who will coordinate the spectrum-related activities and requirements within their Directorate or office; provide those spectrum requirements to the Director of Spectrum Policy and Planning or designee; and provide support and representation to the SCaN Board of Directors meetings, as necessary, for addressing senior spectrum issues.

2.2.2 For future Agency missions, each NASA Mission Directorate, through the SCaN Board of Directors, shall provide the latest conceptual spectrum requirements (communications, remote sensing, and any others) and an economic analysis [5] justifying the need for the specific frequency and bandwidth, as required by OMB Circular A-11,

Section 31.12, to the Director of Spectrum Policy and Planning with respect to programs and future missions. This economic analysis will be completed and each system certified by the NTIA before funding can be provided. NTIA may also review these analyses during the certification process.

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[5] Subject to revision by the NTIA, an economic analysis for purposes of spectrum system certification is a statement that the value of the relevant spectrum was considered. It should indicate whether the system procured was the most spectrum "efficient" solution among the solutions considered in meeting specified mission/operational requirements.

2.2.3 Under 51 U.S.C. 20113(a), NASA has the responsibility to seek and encourage, to the maximum extent possible, the fullest commercial use of space. To the extent NASA technology programs are involved in supporting the U.S. commercial communications satellite industry and to the extent necessary to ensure adequate spectrum support for these programs, the National Spectrum Program Manager provides adequate coordination and representation to work with the FCC.

2.3 NASA Center Responsibilities

2.3.1 The Center Directors and the JPL (an FFRDC) Director shall:

a. Ensure that all Center/Facility long-term spectrum requirements are reported annually to the Director of Spectrum Policy and Planning.

b. Ensure that all missions, projects, and other activities requiring use of the EM spectrum submit to the Center/Facility SM a request for spectrum certification, which will be submitted to the NTIA, through NASA Headquarters, as early in the procurement cycle as possible.

c. Ensure the EM integrity of the property on which the Center or JPL (an FFRDC) and its Component Facilities are located, including protecting the property from EM interference.

d. Implement the policies, applicable procedures, and spectrum management functions at the Center or JPL (an FFRDC) and Component Facilities in accordance with this NPR and NASA Headquarters Procurement policies. The policies will ensure that spectrum-dependent missions, programs, or activities will not receive funding without approval from the Center SM. A waiver of this requirement may be granted by the DAA SCaN through the applicable Center SM and Director of Spectrum Policy and Planning.

e. Ensure that all RF-related contracts, grants, or agreements (radio-based communications systems, wireless systems, which include: LAN, WAP, WiFi, Bluetooth, walkie-talkies, wireless microphones; active or passive remote-sensing systems; all systems employing satellite (space) techniques; and any associated Earth-station sites and facilities) are made with the approval of the applicable Center/Facility SM and are in compliance with NASA and Federal regulations and policies.

f. Designate a civil servant or JPL (an FFRDC) employee as Center/Facility SM to perform the spectrum management function.

g. Designate a civil servant or JPL (an FFRDC) employee as alternate Center/Facility SM to assist and provide backup to the primary Center SM.

h. Ensure continuity of Center/Facility Spectrum Management by developing and maintaining a plan for Center/Facility SM succession. This succession plan will be submitted annually to the Director of Spectrum Policy and Planning.

i. Provide the funding required to fulfill the Center/Facility's spectrum management responsibilities in accordance with this policy.

j. Ensure that communication outside of NASA on spectrum-related matters has been coordinated and approved by the Director of Spectrum Policy and Planning or designee.

2.3.2 The GSFC SM shall assist other Center/Facility SMs in investigating incidences of RF interference that may occur in the 2025-2110 MHz and 2200-2290 MHz bands. GSFC will consult with JSC and JPL (an FFRDC) for protection requirements of human spaceflight and the Deep Space network (DSN), respectively.

2.3.3 All Center/Facility Spectrum Managers, JPL (an FFRDC) Spectrum Manager, and their alternates shall:

a. Coordinate frequency use for NASA missions, programs, and projects at their respective Center/Facility.

b. Function as the interface between its Center/Facility missions and the other Center/Facility SMs.

c. Ensure that all missions, projects, and other activities, requiring use of the EM spectrum, submit a request for spectrum certification, which is submitted to the NTIA, through NASA Headquarters, as early in the acquisition and procurement cycles as possible, as well as ensuring that any required economic cost/benefit analysis is completed and submitted with requests for frequency certification.

d. Ensure that these submissions are compliant with domestic (NTIA Manual) and international (ITU Radio Regulations) regulations, as well as SFCG recommendations, and provide guidance on the selection of properly allocated frequency bands to fulfill mission requirements. A waiver of this requirement may be granted by the Director of Spectrum Policy and Planning, through the applicable Center SM.

e. Obtain Radio Frequency Authorizations (RFAs) in the Government Master File (GMF) for all transmitters (including active remote sensing or communications use whether spaceborne or otherwise).

f. Obtain RFAs in the GMF for all receivers or radiometers for passive sensing or communications use whether spaceborne or otherwise. Such authorization will also take place for individual NASA-owned and/or operated instruments located in or on platforms owned by other U.S. Government agencies or foreign entities.

g. Ensure that all RF equipment belonging to other Government agencies and operating at NASA facilities or onboard NASA vehicles operated by the Center/Facility has received proper authorization to operate. The responsibility for obtaining that authorization is not necessarily the responsibility of the Center/Facility Spectrum Manager.

h. Review any non-NASA systems which are identified within domestic or international system filing and coordination processes for potentially causing interference to the Center operations and provide comments as required.

i. Ensure Centers/facilities adhere to the NTIA channel plan for the Very High and Ultra High Frequency land mobile radio bands.

j. Ensure that all NASA Center/Facility spacecraft requirements for use of the S-Band (2025 - 2110 MHz and 2200 - 2290 MHz) are provided to the National Spectrum Program Manager and the GSFC SM for their review and approval.

k. Ensure that permanent assignments are promptly renewed or deleted from the GMF at the time of their RFA 5-year review.

l. Maintain accurate records [6] of all frequency assignments in use by the Center and JPL (an FFRDC).

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[6] The Manual in NPR 1441.1, NASA Records Retention Schedules, should be followed to maintain and safeguard these records. Records such as documents and reports can only be disposed of based on the retention periods in NPR 1441.1. If an item is not described in NPR 1441.1, contact your Center Records Manager for assistance.

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m. Maintain the electromagnetic integrity of the site and its flight missions through proper selection of RF equipment frequencies and electromagnetic compatibility (EMC) testing.

n. Ensure day-to-day interference-free operations at the site and by its flight missions.

o. Identify communication and other RF EM spectrum requirements such as active and passive remote sensing requirements or future missions proposed by the site and report as early as possible to the National Spectrum Program Manager for inclusion in NASA long-range spectrum forecasts.

p. Prepare technical analyses required to support spectrum applications for site projects.

q. Participate in local, national, and international spectrum management coordination groups to provide representation and cognizance of the Center/Facility's project requirements.

r. Coordinate the development and maintenance of Center/JPL (an FFRDC) instructions for spectrum management with the National Spectrum Program Manager to ensure wide program consistency.

s. Serve as the representative for the Director of Spectrum Policy and Planning to the NASA programs/projects at their Centers and JPL (an FFRDC) and participate as a member of the NASA Spectrum Managers Group.

t. Coordinate with the local Center/Facility Radiation Safety Officer (RSO) and/or Non-Ionizing Radiation Safety Officer to ensure that RF and electromagnetic field emissions conform to the latest requirements of IEEE C95.1, Standard for Safety Levels with Respect to Human Exposure to Radio Frequency Electromagnetic Fields 3 kHz to 300 GHz and the ICNIRP Electromagnetic Field Standard, 1 Hz to 300 GHz.

u. Coordinate RF EM spectrum requirements with the NASA Center Safety and Mission Assurance Office or NASA Center Office with responsibility for RF safety. Based on the particular Center mission responsibilities, RF emissions will be coordinated with other operations such as range safety, flight operations, operation safety, explosive safety, and propellant handlers.

v. Represent respective Center or JPL (an FFRDC) at the NASA Spectrum Managers Group (NSMG) meeting, which meets at least annually to review issues pertinent to all Centers and JPL (an FFRDC) (see Appendix E).

w. Coordinate FOIA-related matters with the National Spectrum Program Manager to ensure consistency with Agency-level positions.

2.4 Mission/Program/Project Responsibilities

2.4.1 Each mission, program, project, and other activity with RF EM spectrum requirements at a NASA Center [7] has the following responsibilities:

[7] For purposes of this and subsequent sections within the document, Center also applies to JPL (an FFRDC).

a. to discuss spectrum considerations at each review in the project life cycle.

b. to receive approval from the responsible Center Spectrum Manager that program/project spectrum goals and progress are being achieved and all applicable spectrum regulatory requirements are satisfied at the entrance and success criteria in all life-cycle and technical reviews.

2.4.2 The specific spectrum criteria for the life-cycle reviews (as provided in NPR 7123.1, NASA Systems Engineering Processes and Requirements) are defined in Table 2.1 and illustrated in Figure 2-3.

Table 2.1: Spectrum Requirements for Program/Project Reviews

Phase/Review	Entrance Criteria	Success Criteria
Pre-Phase A	Notify Center Spectrum Manager of EM spectrum use concept	
Mission Concept Review (MCR)	Preliminary assessment of EM spectrum (radio frequency) requirements	Concurrence by the responsible Center Spectrum Manager that EM spectrum needs have been properly identified and addressed
System Requirements Review (SRR)	EM spectrum needs have been addressed including preparing requisite data for the responsible Center Spectrum Manager for possible Stage 1 Certification.	Concurrence by the responsible Center Spectrum Manager that the program/project has provided requisite EM spectrum system data.
System/Mission Definition Review (SDR)	EM spectrum considerations addressed	Concurrence by the responsible Center Spectrum Manager that spectrum considerations have been addressed
Preliminary Design Review (PDR)	Design details and requisite data have been submitted to Center/Facility Spectrum Manager for preparation of request for certification of Stage 2 spectrum support by at least 60 days prior to PDR	Concurrence by the responsible Center Spectrum Manager that the program/project has provided requisite EM spectrum system data
Critical Design Review (CDR)	- Received Stage 2 (Experimental) system certification signed by NTIA - Provide measured/as designed parameter updates to Center/Facility Spectrum Manager for request for certification of Stage 4 (Operational) spectrum support no later than 60 days prior to CDR	Concurrence by the responsible Center Spectrum Manager that the program/project has provided requisite EM spectrum system data
Production Readiness Review (PRR)	EM spectrum considerations have been addressed	Concurrence by the responsible Center Spectrum Manager that program complies with spectrum policy and regulation

System Integration Review (SIR)	NA	NA
Test Readiness Review (TRR)	EM spectrum considerations have been addressed	Concurrence by the responsible Center Spectrum Manager that all tests are performed in accordance with spectrum policy and regulation
System Acceptance Review (SAR)	Received Stage 4 (Operational) system certification signed by NTIA	Concurrence by the responsible Center Spectrum Manager that the Stage 4 (Operational) system certification has been obtained and the system is compliant with spectrum policy and regulation
Operational Readiness Review (ORR)	- Received Stage 4 (Operational) system certification signed by NTIA - All requisite radio frequency authorizations are in place	Concurrence by the responsible Center Spectrum Manager that all necessary spectrum certification(s) and authorization(s) have been obtained
Flight Readiness Review (FRR)	- Received Stage 4 (Operational) system certification signed by NTIA - All requisite radio frequency authorizations are in place	Concurrence by the responsible Center Spectrum Manager that all necessary spectrum certification(s) and authorization(s) have been obtained
Post-Launch Assessment Review (PLAR)		Concurrence by the responsible Center Spectrum Manager that the system is compliant with spectrum policy and regulation
Critical Event Readiness Review (CERR)	Critical event/activity requirements and constraints have been identified, including spectrum considerations	Concurrence by the responsible Center Spectrum Manager that the system is compliant with spectrum policy and regulation
Post-Flight Assessment Review (PFAR)	Problem reports, corrective action requests, and post-flight anomaly records are completed. Include Spectrum (radio frequency) interference or other related factors during assessment	Notify the responsible Center Spectrum Manager
Decommissioning Review (DR)		Notify the responsible Center Spectrum Manager
Disposal Readiness Review (DRR)		Notify the responsible Center Spectrum Manager

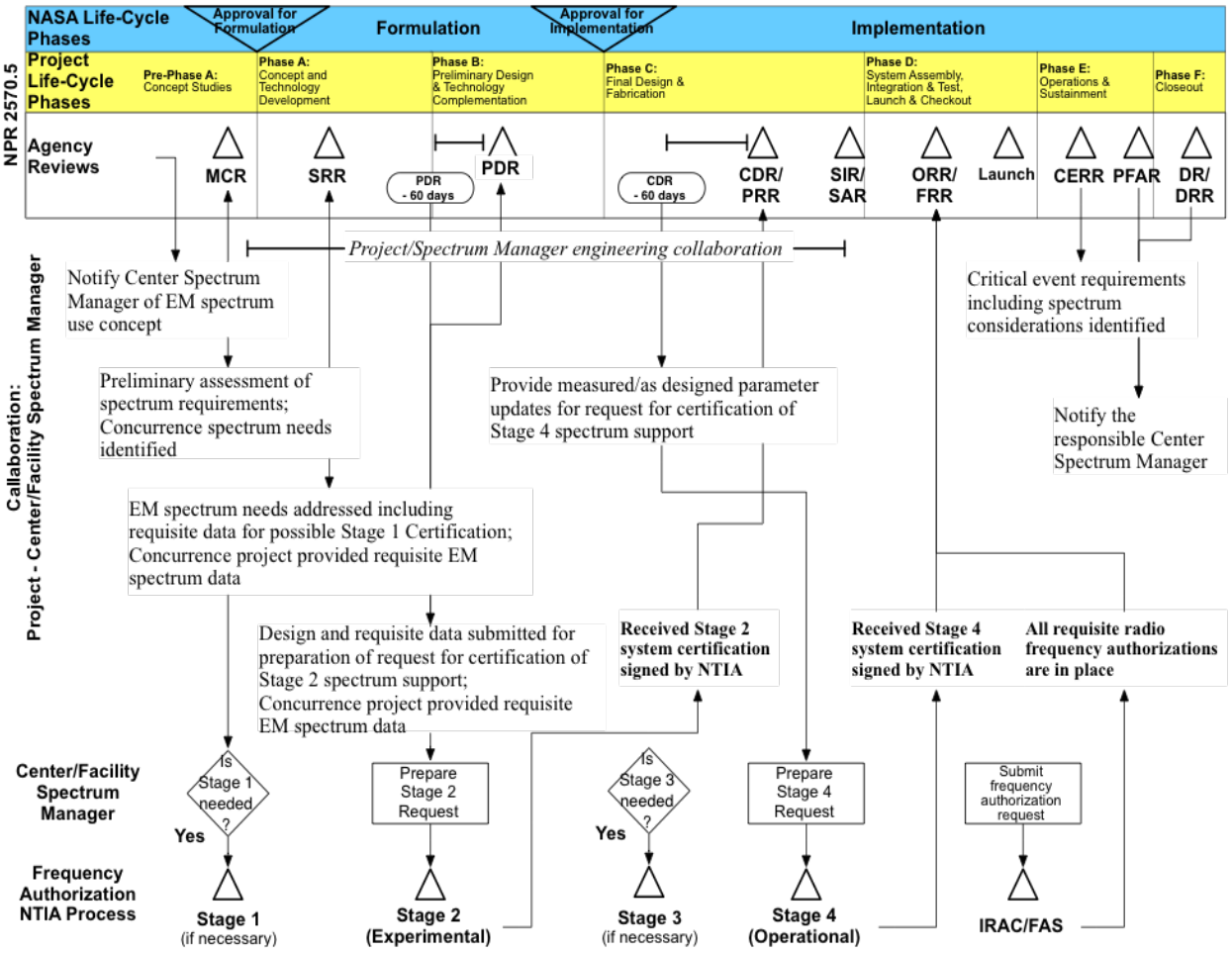

Figure 2-3: Spectrum Requirements Overlay on NASA Program/Project Life-Cycle Process

2.5 Host Responsibilities

2.5.1 Each program or project hosting equipment, experiments, and/or payloads with RF requirements at a NASA Center (i.e., NASA provides the platform, but does not control/own the RF equipment -- transmitters/receivers) has the following responsibilities:

a. Feasibility/Conceptual phase

(1) Inform the RF equipment/experiment/payload owner (i.e. customer) that spectrum certification and RF authorization/license to operate the equipment is their responsibility. An approved RF license (experimental or operational, depending on the use and scenarios) is a prerequisite for flight manifest.

(2) Notify Center Spectrum Manager of the new RF equipment use concept.

(3) Request, from customer, a copy of RF license for each RF transmitter and submit to Center Spectrum Manager for review and approval for flight use.

(a) Aircraft platforms: no later than eight weeks prior to first flight

(b) Space platforms: no later than System Requirements Review (SRR)

b. Prior to First Flight

(1) Customer will provide approved RF license(s) to program for final validation by the Center Spectrum Manager.

(2) Failure to provide approved RF license(s) will result in delay of first flight.

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